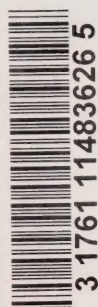




# GREAT LAKES FACT SHEET



## Forest Birds in Urban Areas: Habitat Needs of Area-Sensitive Species

This fact sheet is based on *Area-Sensitive Forest Birds in Urban Areas*, a report of the Canadian Wildlife Service – Ontario (2006).



Scarlet Tanager /  
Walter B. Fechner

*Catching a glimpse of a Scarlet Tanager or hearing the resounding rap of a Pileated Woodpecker are increasingly rare experiences in urbanizing areas of southern Ontario. In the Greater Toronto Area (GTA), there are typically only 14 area-sensitive forest bird species breeding, compared to more than 40 potential breeding species. A continued loss of forest cover and the fragmentation of remaining forests have diminished the amount and quality of breeding habitat for area-sensitive forest bird species. The impact on these birds is most profound in extensive urban areas where urban stresses and a lack of suitable forest habitat greatly limit species diversity and population viability.*

**Area-Sensitive Forest Birds:** species requiring a relatively large forest patch within which to reproduce successfully. Many of Ontario's forest birds, including many migrant raptors and songbirds, are fully or somewhat area-sensitive, being drawn to large forest patches to fulfill breeding needs and seek protection from nest parasites and other disturbances.

An urban environment is generally not suitable for use by area-sensitive forest birds as breeding habitat. The most effective conservation approach would be to address urbanizing watersheds before urbanization occurs, by identifying and protecting existing forest cover well above a minimum 30 percent cover threshold. This approach does not preclude forest restoration in urban areas. Urban forests provide many vital ecological services, including the provision of habitat for other bird and wildlife species, as well as providing services to humans. There are forest restoration actions that can be taken to benefit migratory and resident populations of forest birds that will also greatly enhance other vital ecological services such as improving air and water quality and attenuating local climatic extremes.

Irreversible land-use changes due to urbanization may require that decision makers set new goals for providing ecological services in urban areas. The debt of lost or diminished services, such as viable breeding habitat for area-sensitive forest birds, genetic, species and community diversity, pollination, and carbon sequestration should be acknowledged by retaining and enhancing those services elsewhere in the non-urbanized parts of a watershed.



American Redstart – Walter B. Fechner





# Urban Forest Ecological Services Beyond Area-Sensitive Forest Bird Breeding Habitat

Conservation of urban forests is vital to sustain human communities, many natural processes and help prevent further degradation of already diminished ecological services. Urban forests have many values; provide a multitude of benefits and ecological services; and are necessary contributors to maintaining biodiversity.

Urban forests provide food and shelter for various groups of birds, mammals, fish and other vertebrates. They also provide shade and cool watercourses, and mitigate noise and dust. Air quality is improved by oxygen production, pollution absorption and carbon sequestration. Trees help to conserve energy by indirectly mitigating climatic effects through providing evaporative cooling, windbreak and shading functions, reducing human dependence on power generation. Urban forests contribute to water quality and quantity improvement through storm-water control, attenuation of peak flows, maintenance of base flow, erosion control and rainfall. Not to be overlooked are the essential benefits associated with trees in terms of human physical, mental and social health.



Blackburnian Warbler / Eric Dresser

## Area-Sensitive Forest Birds in Urban Areas

The overriding recommendation of the report, *Area-Sensitive Forest Birds in Urban Areas* (2006), is to retain and enhance existing forest cover within watersheds outside of urban areas. The report, on which this fact sheet is based, also lists and assesses 13 primary urban stressors on urban forest birds; examines the effects of forest habitat size and configuration on area-sensitive forest breeding birds; compares the potential occurrence versus actual occurrence of area-sensitive forest birds in the Greater Toronto Area; and provides guidance on restoring and enhancing urban forests for birds.

## How Much Habitat is Enough?

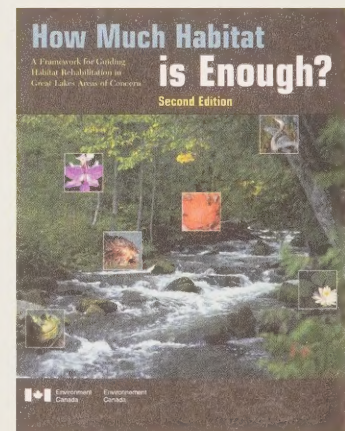
The report, *Area-Sensitive Forest Birds in Urban Areas*, is a supplement to *How Much Habitat is Enough? A Framework for Guiding Habitat Rehabilitation in Great Lakes Areas of Concern, 2nd Edition* (2004). The *Framework* provides guidance for selecting locations where wetland, riparian and forest habitat can be restored most effectively and efficiently. The *Framework* articulates 18 key guidelines which can be adopted or adapted for local watersheds. It also provides background information based on existing literature and practices. Seven of the guidelines address forest habitat, including forest cover, interior forest and connectivity. The *Framework* has been used within and outside of Great Lakes Areas of Concern.

**The *Framework* helps guide decision-making regarding:**

- how much habitat is needed to support a natural, functioning ecosystem; and
- the identification of priority locations for wetland, riparian and forest rehabilitation and protection across a watershed or landscape.

These publications are meant to guide, not dictate, local decisions. They provide general guidance that is meant to be adapted to local conditions. The information is not landscape specific.

*Area-Sensitive Forest Birds in Urban Areas*, the *Framework* and additional information are available from Environment Canada's Canadian Wildlife Service (Ontario).





# Potential Urban Stressors on Forest Birds

There are human-induced stressors that are either unique to urban areas or are greatly amplified in such areas. These stressors may affect almost all forest birds to some degree but, in many cases, they will have especially pronounced effects on area-sensitive forest birds. The following chart identifies the primary stressors and estimates their relative importance.



Forest and Urban Area / Canadian Wildlife Service

## Primary Human-Induced Stressors for Forest Associated Breeding Birds in an Urban Environment

Stressor	Likely Relative Importance	Notes
Disruption of Ecosystem Process	High to Moderate	<ul style="list-style-type: none"> <li>Includes: disruption of nutrient and water cycles and productivity</li> </ul>
Urban-sponsored Native Predators	High to Moderate	<ul style="list-style-type: none"> <li>Includes: Blue Jay, American Crow, Common Grackle, gray squirrel, red squirrel, eastern chipmunk, raccoon, striped skunk, red fox</li> <li>Bird feeders may be implicated</li> </ul>
Noise	High to Moderate	<ul style="list-style-type: none"> <li>Increasing evidence that noise, especially traffic noise at high levels, can limit forest breeding birds</li> </ul>
Barriers to Connectivity	Moderate to High	<ul style="list-style-type: none"> <li>Barriers may become more important when forest cover falls below 30 percent, actual effects of barriers poorly established for birds, effects difficult to isolate from other factors (patch size and forest cover)</li> </ul>
	Uncertain	<ul style="list-style-type: none"> <li>More uncertain how important barriers may be once forest cover exceeds 30 percent</li> </ul>
	None	<ul style="list-style-type: none"> <li>Unlikely to be an effect where forest cover exceeds 70 percent</li> </ul>
Direct Disturbance	Moderate	<ul style="list-style-type: none"> <li>Walkers and mechanical disturbance (e.g., mountain bikes) impede the breeding of sensitive birds, heavy-use trails may displace more birds</li> </ul>
Habitat Alteration	Moderate	<ul style="list-style-type: none"> <li>Includes: loss of vegetation (soil compaction, trampling, erosion, cutting, composting), non-native plants, loss of forest structure (e.g., closed canopy of urban forests)</li> </ul>
Nest Parasitism	Moderate	<ul style="list-style-type: none"> <li>Studies show nest parasites contribute to lower productivity but are not primary constraints on productivity; parasites can be enhanced by the urban matrix</li> </ul>
Urban sponsored Non-native Predators	Moderate to Low	<ul style="list-style-type: none"> <li>Outdoor cats mostly prey on small mammals but may affect some species</li> </ul>
Psychological and Social Behaviour	Uncertain / High?	<ul style="list-style-type: none"> <li>Breeding birds may need to maintain a distance from urban infrastructure or may need the presence of the members of same species</li> </ul>
Food Supply Changes	Uncertain / Moderate?	<ul style="list-style-type: none"> <li>Evidence that forest-bird abundance relates to invertebrate food supply and that invertebrates are reduced in urban forests</li> </ul>
Light	Uncertain / Low?	<ul style="list-style-type: none"> <li>Little empirical evidence is available</li> </ul>
Removal of Top Predators	Uncertain / Low?	<ul style="list-style-type: none"> <li>May help explain large numbers of certain urban-sponsored predators</li> </ul>
Contaminants	Uncertain	<ul style="list-style-type: none"> <li>Empirical data lacking, probably more effect on food supply; ecological risk assessment relatively new</li> </ul>





Savanna fire / Ontario Ministry of Natural Resources

## *Disruption of Ecosystem Processes*

The disruption of natural processes through actions such as suppression of fire, overuse of water resources and alteration of nutrient pathways, can result in negative effects such as increases in nutrient availability. This may help to explain why some non-native invasive plants have a competitive advantage over native species, thereby affecting the composition and ecological functions of forest-bird habitat.

## *Predation*

Several native nest predators such as red foxes, American Crows, gray squirrels and Blue Jays thrive in urbanized environments. Many, such as raccoons, maintain higher population densities in urban areas than in rural areas. In addition, there is evidence that supplemental food sources, particularly bird feeders, subsidize local native predator populations. Native predators have a greater relative impact than non-native predators. The domestic cat is the primary non-native predator. While cats are more abundant in urban environments, it is unclear if their hunting efforts are particularly directed at area-sensitive forest birds, as most pet cats range a maximum of 100 to 200 metres from their homes. There is also a theory that the removal of large predators such as timber wolves, bobcats and cougars results in increases in carnivores that are lower on the food chain (meso-carnivores), such as raccoons. Two studies found a reduction in nest predation when coyotes were present, presumably due to a lower raccoon population.



## *Noise*

It is well established that sudden unpredictable human-generated noises will elicit a flight or alert response in birds, but there is also growing scientific evidence that constant vehicular traffic noise is an important stressor. The effect may be limited to busy roads (over 10,000 vehicles per day) and especially commuter roads, where heaviest morning traffic volume coincides with important periods of birdsong related to courtship.

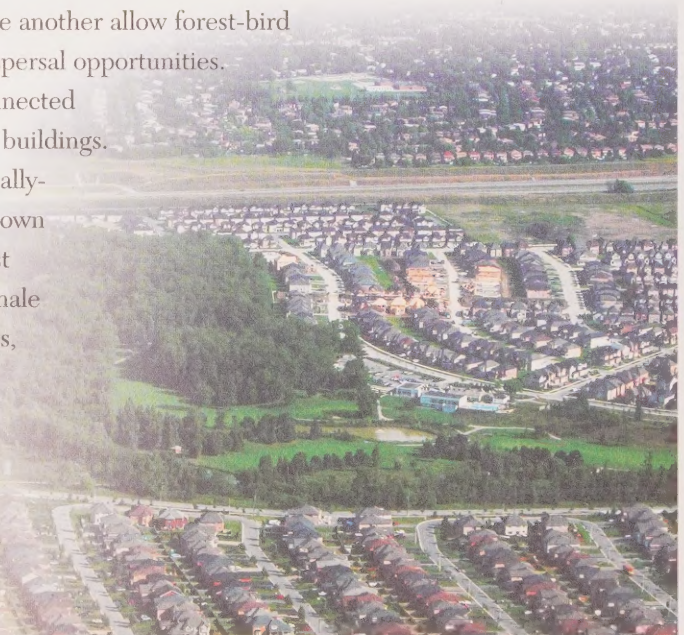
## *Barriers to Connectivity*

Generally, habitat patches that are connected or close to one another allow forest-bird species, especially less mobile ones, better breeding and dispersal opportunities.

Habitat patches in urban areas are scattered and poorly connected within a landscape dominated by roads, paved surfaces and buildings.

However, the extent to which these land uses form ecologically-limiting barriers is largely unknown. Recent studies have shown that certain forest-bird species will travel through non-forest habitat more easily than previously thought. For example, male Hooded Warblers will travel up to two-and-a-half kilometres, potentially crossing nearly a half-kilometre of open fields, during breeding. Connectivity becomes more important when forest cover in a landscape drops below 30 percent.

Recent studies have shown that total forest cover may be a more important factor than the configuration or connection of forest patches, with barriers likely having little or no effect once forest cover surpasses 70 percent.



Fragmentation / Canadian Wildlife Service



## *Direct Disturbance and Trails*

Forest habitats in urban areas are generally subjected to higher levels of human use and greater trail density than rural forests. Such use leads to disturbance of forest breeding birds during crucial reproductive activities such as egg incubation and feeding of young. Overall, it appears that direct disturbance, from activities such as walking or cycling either on or off trails, can be detrimental to all but a few very tolerant species. The disturbance level may be enough that it contributes to the actual loss of some species from urban forest fragments.



Trail use / Graham Bryan

## *Habitat Alteration*

Trampling, recreational uses and “tidying-up” by humans often result in a direct loss of understorey plants and natural litter that, in turn, affects certain forest birds. Further, through a lack of forest management or loss of natural disturbance processes, forest structure can be “homogenized”, with a resultant loss of lower to mid-level vegetation layers. In many cases, native plants provide superior nesting and foraging sites; yet in urban areas there is generally a greater abundance of exotic and invasive plant species. As well, there are often fewer available snags and cavities for native cavity nesting birds, either through direct removal or competition from non-native species, such as European Starlings.

## *Nest Parasitism*

Brown-headed Cowbirds are the main nest parasites of forest breeding birds. They are more likely to lay their eggs in host bird nests located within approximately 100 metres from the forest edge. Cowbird nest parasitism is likely increased by the elevated amount of human and associated disturbances in urban forests, and the lack of urban forests large enough to contain interior habitat.



Brown-headed Cowbird / U.S. Fish and Wildlife Service



## Psychological and Social Behaviour

Mere proximity to human features such as residential development may be a major, but under studied, factor in forest-bird declines. A lack of other members of the same species may also influence use of a forest patch.

## Food Supply Changes

Many forest birds feed on insects and arthropods. It is possible that these species, like birds and mammals, are affected by forest fragmentation, in turn influencing food supply for forest birds. Studies of forest fragmentation in urban areas in Japan, Australia and the United States have shown effects that include decreases in arthropod and/or insect species richness and abundance, and changed species composition.

## Light

While there is awareness concerning the phenomenon of migrating birds striking tall, lit buildings at night, there is little other documentation of the day-to-day effects of artificial light on breeding forest birds. It would seem intuitive that artificial light has an effect but this may be species-specific and not necessarily detrimental at a population level.

## Contaminants

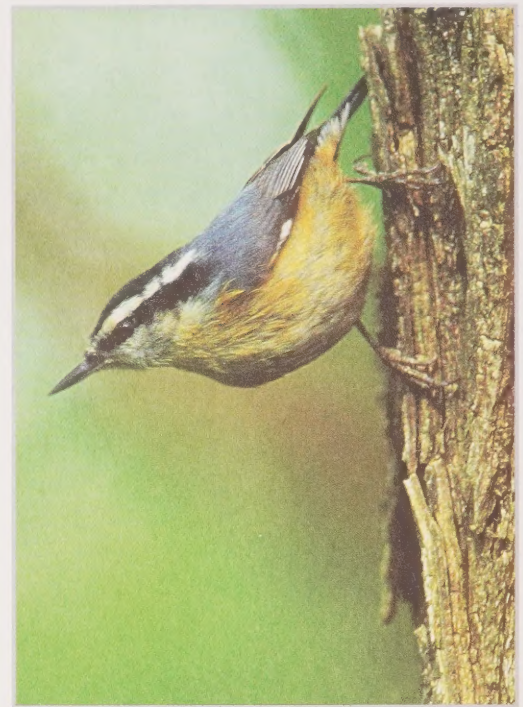
The effects of contaminants on birds are uncertain when comparing urban and non-urban landscapes.

# Forest Habitat Size and Configuration

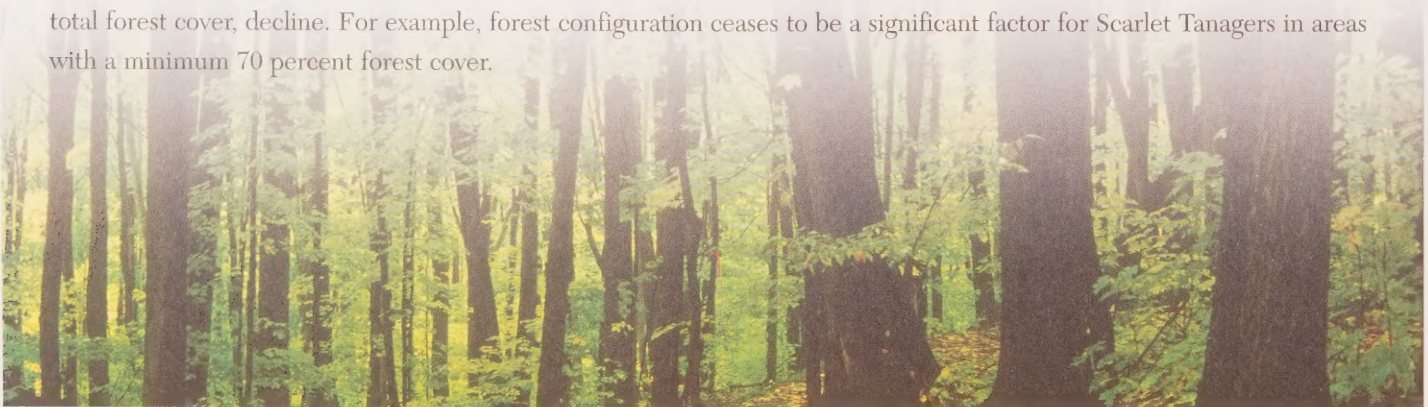
The amount and configuration of forest habitat greatly influences which area-sensitive forest-bird communities can be expected. This must be considered in combination with individual stressors. The overall amount of forest cover is generally of greatest importance; forest fragmentation becomes increasingly important in landscapes with less than 30 percent forest cover.

Individual stressors, forest size, forest fragmentation and overall forest cover all play interrelated and complex roles that are not fully understood. General principles, such as those presented in the *Framework*, can help guide restoration and conservation in a watershed or larger landscape but for individual woodlots these principles must be considered in the context of on-site characteristics. The table on page 7 lists the *Framework* forest guidelines and provides a subjective assessment of the general categories in which the guidelines fall.

Guidelines pertaining to forest configuration and linkages will assume greater importance when other conditions, such as total forest cover, decline. For example, forest configuration ceases to be a significant factor for Scarlet Tanagers in areas with a minimum 70 percent forest cover.



Red-breasted Nuthatch / Walter B. Fechner



Upland Hardwood Forest in Fall / James Sidney



## Summary Assessment of How Much Habitat is Enough? (2004) Forest Habitat Guidelines

Habitat Framework Parameter	Habitat Framework Guideline	General Category	Likely Relative Importance	Comments
Percent forest cover	At least 30 percent of the Area of Concern watershed should be in forest cover.	Percent Forest Cover	Very High	Threshold may be around 30 percent for forest birds, below which forest breeding birds decline and other habitat factors start to play a greater role (e.g., patch size, connectivity).
Size of largest forest patch	A watershed or other land unit should have at least one 200 ha forest patch which is a minimum 500 m in width.	Habitat Quality	High	A general concept that incorporates a range of factors such as: shape, interior, age, composition, structure, invasive species.
Forest quality — species composition and age structure	Watershed forest cover should be representative of the full diversity of forest types found at that latitude.			
Forest shape	To be of maximum use to species such as forest breeding birds that are intolerant of edge habitat, forest patches should be circular or square in shape.			
Percent of watershed that is forest cover 100 m and 200 m from forest edge	<p>The proportion of the watershed that is forest cover 200 m or further from the forest edge should be greater than five percent.</p> <p>The proportion of the watershed that is forest cover 100 m or further from the forest edge should be greater than 10 percent.</p>	Patch Size	Less than 30 percent forest cover: <b>High</b>	In fragmented landscapes with less than 30 percent forest cover this factor may play a greater role. There is little guidance in the literature on the upper level of patch size effect on forest birds, likely to be landscape/species dependent and in the 1,000s of ha.
			More than 30 percent forest cover: <b>Moderate</b>	In landscapes with more than 30 percent forest cover patch size appears to be less critical, but it is difficult to isolate the effect of patch size from other key factors.
			More than 70 percent: <b>None</b>	In landscapes with more than 70 percent forest cover, patch size may not be important.
Proximity to other forested patches	To be of maximum use to species such as forest-interior birds, forest patches should be within two km of one another or other supporting habitat features.	Connectivity	Moderate	Few empirical studies demonstrate the importance of connectivity for forest birds, so it has been difficult to tease apart the relative importance of forest cover and connectivity; ecological mechanisms and effects of fragmentation are poorly understood. Likely to be more important once forest cover is less than 30 percent, and less important over 70 percent.
Fragmented landscapes and the role of corridors	Connectivity width will vary depending on the objectives of the project and the attributes of the nodes that will be connected. Corridors designed to facilitate species movement should be a minimum of 50 to 100 m in width. Corridors designed to accommodate breeding habitat for specialist species need to be designed to meet the habitat requirements of those target species.			





Black-throated Green Warbler / Eric Dresser

There is a tendency to assess woodlands in areas with the lowest forest cover as the most significant, compared to woodlands in areas where forest cover is still at relatively high levels. However, in terms of area-sensitive forest birds, the opposite appears to be true. High forest cover and large forest patches are likely to be more important for the conservation of forest birds in southern Ontario, not connected fragments.

## Breeding Bird Expectations for Toronto's Urban Forests

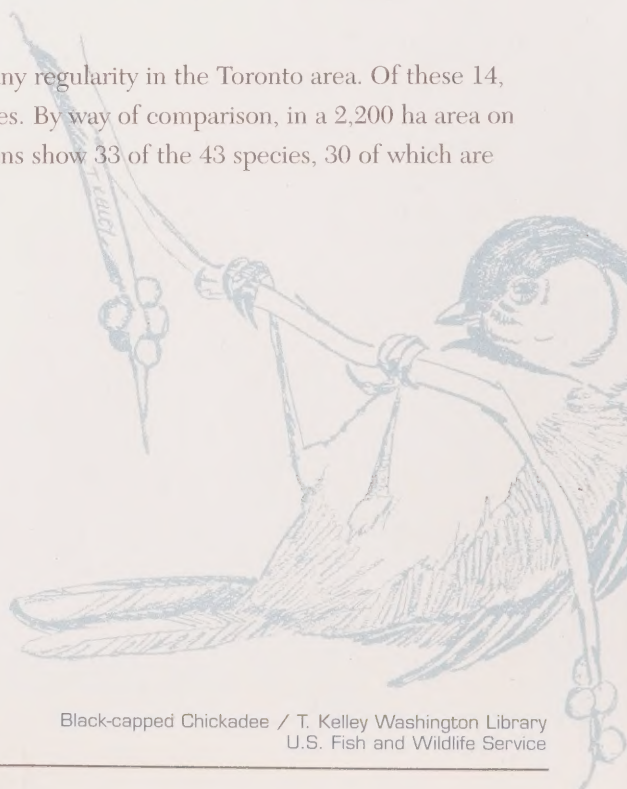
At one time there may have been as many as 43 area-sensitive forest bird species breeding in what is now Toronto (approximately 65,000 hectares). This estimate was made using sources such as newsletters of the Toronto

Ornithological Club, breeding bird data from the Toronto and Region Conservation Authority, and results from studies in various forest patches (e.g., Altona Forest, High Park and Block 12-Vaughan) around the GTA. A list of potential area-sensitive forest breeding birds for the Toronto area is published in the report, *Area-Sensitive Forest Birds in Urban Areas*.

Today, only 14 of the 43 species typically occur as breeding birds with any regularity in the Toronto area. Of these 14, only nine breed on a more or less annual basis in suitable habitat patches. By way of comparison, in a 2,200 ha area on the Oak Ridges Moraine (also within the GTA), unpublished observations show 33 of the 43 species, 30 of which are regular breeders.

## Can area-sensitive forest breeding birds be maintained in an urban matrix?

Even if the 30 percent forest-cover threshold could be attained in predominantly urban areas, the multiple stressors and their effects lead to the conclusion that the maintenance of area-sensitive forest-bird diversity and urbanization are incompatible. Very few area-sensitive forest birds will persist as breeders. However, some other forest-bird species will persist, as well as various other groups of wildlife, and steps can be taken to enhance urban-forest habitat for those species.



Black-capped Chickadee / T. Kelley Washington Library  
U.S. Fish and Wildlife Service



# Urban areas, Urbanizing areas, Watersheds and Expectations

The ecological reach of urban areas extends far beyond urban boundaries. Cities, towns and villages rely upon their surrounding landscapes and watersheds for many benefits including energy, food and water. There is a net “debt” of ecological services. Yet, in terms of area-sensitive forest birds there are still many opportunities to meet or exceed the 30 percent forest-cover threshold, along with other *Framework* guidelines, within the non-urban portions of many urban-influenced watersheds (i.e., outside of the existing urban limits).

A restoration and conservation approach that seeks to identify and protect existing forest cover well above the minimum 30 percent threshold, before significant pressures of urbanization arrive, is the most practical and appropriate means to provide habitat for area-sensitive forest birds. Such an approach also helps to begin to balance the ecological services debt of urban areas.

However, for area-sensitive forest birds only partial restitution will ever be possible as the quality and variety of forest in terms of habitat types is only fully expressed across the full suite of soils, climate and microclimate, hydrology and ecological regions within an entire watershed or landscape. There are particular natural heritage features that have been lost and continue to be lost, such as large hardwood swamps and mature Carolinian forest. For area-sensitive forest birds, it is vital to retain the remaining important habitat and not convert most of the landscape to a predominantly urban matrix.

In terms of on-site mitigation and restoration, the inability of urban forests to support the potential list of area-sensitive forest birds does not preclude their importance for other ecological values and functions. Restoration within urban areas could be targeted at ecological services that can viably be restored or enhanced within an urban environment. Urban forests should be assessed in terms of realistic expectations and ecological goals within the context of “urban ecosystems”.

**Urban-sensitive birds:** breeding birds that are considered to be sensitive to urban effects. There are very likely species that are not forest birds (e.g., grassland birds) and/or are not generally thought of as area-sensitive, that will also be affected by urban stressors. Examples include Grasshopper Sparrow, Brown Thrasher and Eastern Meadowlark. One could consider these species, along with area-sensitive forest birds, to be, as a group, sensitive to the urban environment.



Urbanization – Carruthers Creek, Ajax / Canadian Wildlife Service



# Restoring and Enhancing Urban Forests

While area-sensitive forest birds, and likely other urban-sensitive birds, will generally not breed successfully even in response to efforts to increase the quality and quantity of urban forest habitat, they still use urban forests at other life cycle stages, such as during critical migration periods. There are many urban-tolerant birds that use urban forests. There are restoration and management efforts that could improve bird habitat in urban areas, enhance overall wildlife habitat, improve the delivery of other ecological services and provide social benefits for the human population.

## *Increase Vegetation Layers*

The maintenance or restoration of native vegetation layers (ground cover, shrub, understorey and canopy) and structural diversity, especially lower levels, is important in particular for many area-sensitive forest birds. Some structural aspects may be selected for preferential management (e.g., logging) to attract certain species of management concern. Structural diversity may also be a useful criterion for prioritizing land acquisition programs.

## *Maintain Native Vegetation and Deadwood*

Invasive vegetation has been related to declines in native forest birds. Deadwood is a critical habitat component for many species of wildlife. Where appropriate, forest management should allow for an increase in deadwood and concentrate on planting and encouraging native species and possible removal of invasive species.

## *Provide Adequate Critical Function Zones (CFZ)*

These areas (see discussion in the *Framework*) extend beyond the physical limits of a habitat into the surrounding urban matrix. Often, the CFZ for forest fragments is relatively narrow (encompassing critical root zones for example).

## *Provide Adequate Protection Zones (PZ)*

Protection Zones are located outside of the CFZ to manage the intrusion of effects emanating from the urban matrix into the forest habitat. They need to be designed to ensure that edge effects are managed and may require approaches which avoid attracting large numbers of edge specialists, such as dense plantings of simple-structured forest. Fences and other barriers can be used to limit the effects of people, noise, light, urban runoff and even some pets.



Pileated Woodpecker / EthanMeleg.com



## *Human Intrusion May Not Be Compatible with Interior Conditions*

Human use of natural areas, even “passive” activities such as walking on nature trails, has an effect on wildlife (see Direct Disturbance and Trails). This is especially evident in urban areas where use may be relatively intense. Human intrusion is usually incompatible with maximum use of a forest by wildlife. Careful trail design, the use of techniques to focus pedestrian flow and the identification of, and fencing for, exclusion areas should all be considered.

## *Make the Urban Matrix More Like Forest Fragments*

Greening the urban environment may make the differences between the fragments less critical. Forest canopy in urban areas has been shown to increase populations of at least some forest birds within adjacent forested areas.

## *Discourage Open Lawns*

Lawns cover vast areas in southern Ontario and could provide many benefits if converted to wildlife-friendly habitats. Improvements could include taller grass, native plants and tree planting.



Boardwalk / Matt Young

## *Habitat Fragments May Not Support All Target Species*



Veery – an area-sensitive species / EthanMeleg.com

Habitat should be managed for non-area-sensitive species (e.g., Great Crested Flycatcher, Eastern Wood Pewee), especially as some of these species are also of conservation concern. Some researchers have even suggested that land and wildlife managers in chronically fragmented landscapes focus on shrubland and grassland birds because forest birds are unlikely to be maintained.

Much of the discussion regarding restoration is adapted from Marzluff and Ewing, 2001. (Restoration of Fragmented Landscapes: a general framework and specific recommendations for urbanizing landscapes. *Restoration Ecology*, 9 (3):280-292.)

### **The Remedial Action Plan Connection**

In 1987, through the Great Lakes Water Quality Agreement, the United States and Canada agreed to clean up 43 Areas of Concern (AOCs) across the Great Lakes Basin. The sites have impairments such as contaminated sediments, eutrophication (excess nutrients), degraded fish and wildlife populations, and loss of fish and wildlife habitat. Two decades later, comprehensive Remedial Action Plans (RAPs) document implementation strategies designed to lead to the rehabilitation of AOCs. Considerable progress has been made in rehabilitating and protecting fish and wildlife habitat in these areas and elsewhere in the Great Lakes Basin. To date, two of the 17 original Canadian or bi-national AOCs (Collingwood Harbour and Severn Sound) are no longer designated as AOCs.

The guidelines contained in the *Framework* and in *Area-Sensitive Forest Birds in Urban Areas* were developed to help RAP teams focus rehabilitation efforts and devise criteria to measure progress toward “delisting” an AOC. After delisting, these guidelines can provide further habitat restoration guidance. Innovative fish and wildlife rehabilitation planning and implementation initiatives first conducted in AOCs are now finding widespread application in other jurisdictions.





Black-throated Blue Warbler / Walter B. Fechner

## Great Lakes Fact Sheets

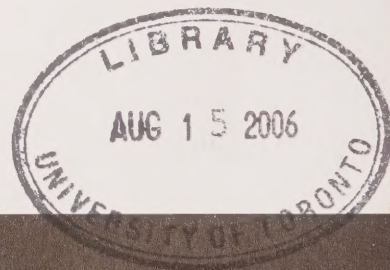
The Great Lakes Fact Sheet series is available on-line at the following URL: [www.on.ec.gc.ca/wildlife](http://www.on.ec.gc.ca/wildlife). Click on publications. All publications are available in both HTML and PDF formats.

To order printed copies of this or any other Great Lakes Fact Sheet, or to request a copy of the full report *Area-Sensitive Forest Birds in Urban Areas* or *How Much Habitat is Enough?* (2nd Edition) contact:

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Aussi disponible en français sous le titre : Les oiseaux forestiers dans les zones urbaines : besoins des espèces sensibles à la superficie de l'habitat

This fact sheet was prepared by Graham Bryan of the Canadian Wildlife Service, based on *Area-Sensitive Forest Birds in Urban Areas* as prepared by Brian Henshaw. The *How Much Habitat is Enough?* series has received funding support from the Government of Canada's Great Lakes Sustainability Fund.

### About the Canadian Wildlife Service

The Canadian Wildlife Service, part of Environment Canada, manages wildlife matters that are the responsibility of the federal government. These include protection and management of migratory birds, nationally-significant habitat and endangered species, as well as work on other wildlife issues of national and international importance. In addition, the Canadian Wildlife Service conducts research in many fields of wildlife biology and provides incentive programs for land stewardship and donation.